Decellularized Porcine Brain Matrix for Cell Culture and Tissue Engineering Scaffolds.

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Public Summary:
Current method of cell culture often uses single proteins and material which do not represent the native environment where the cells normally reside in the tissue. We are interested in reproducing the native environment by extracting the extracellular matrix, which is composed of different types of protein surround the cells, from the brain. We developed a method which allowed us to remove the cellular components and preserve the extracellular matrix from pig brains. When we cultured neurons derived from induced pluripotent stem cells developed from patients, we found that the decellularized pig matrix is superior in promoting maturation of neuronal morphology compared to standard coating. Our work demonstrates the ability to use decellularized brain extracellular matrix for cell culture and tissue engineering applications.

Scientific Abstract:
The extracellular matrix plays important roles in influencing cellular behavior such as attachment, differentiation, and proliferation. However, in conventional culture and tissue engineering strategies, single proteins are frequently utilized, which do not mimic the complex extracellular microenvironment seen in vivo. In this study we report for the first time a method to decellularize brain tissue using detergents. This decellularized brain matrix is rich in glycosaminoglycans and contains collagen I, collagen III, collagen IV and laminin. By further processing the material into a liquid form, the brain matrix can be used as a cell culture coating. Neurons derived from human induced pluripotent stem cells plated on the brain matrix express neuronal markers and assume neuronal morphology. Additionally, the same material can potentially be used as a scaffold for tissue engineering as it reassembles upon injection in vivo to form a gel. Thus, our work demonstrates the ability to use decellularized brain extracellular matrix for cell culture and tissue engineering applications.